MODEL 1294 BIPOLAR DIGITAL PANEL METER

INSTRUCTIONS
WITH PARTS LIS

WESTON®

Electronic Services - Los Ange
M16715X

INSTRUCTIONS WITH PARTS LIST
FOR
WESTON
Model 1294

BIPOLAR DIGITAL PANEL METER

US Patents 3,051,939, 3,316,547
and other Patents Pending

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GENERAL SPECIFICATIONS

Minimum Range	± 00.00 to 100.00 millivolts D.C.
Overrange	± 100% (except on 1000 volt range).
Outrange Indication	Except on 1000 volt range.
Rated Accuracy	± 0.05% of rdg. ± 1 digit ± 10 μV
Input Resistance	$\geqslant$ 10 Megohms
Temperature Coefficient	50 PPM ± .2 digits/° C
Sensitivity	10 microvolts
CMRR	80 DB with 1000 Ω unbalance at 60 Hz
NMRR	35 DB at 60 Hz
Speed	200 Milliseconds per reading
Response Time	1.0 seconds (step function zero to full scale)
Power	117 volt nominal (105 to 129) 50–60 Hz 6 watts
Weight	2 lbs.
Operating Temperature	15° to 35°C
Extreme Operating Temperature	5° to 45°C
Storage Temperature	–40° to 70°C

Refer to Table 1 for a tabulation of specifications pertaining to specific ranges.

NOTE: 1. Model 1294 is available as a 234 volt 50–60 Hz unit under a different part number. Specifications subject to change without notice.

2. BCD outputs T^2L optional.

Weston Part Number	Range DC	Sensitivity	Input Impedance	Full Scale Presentation	Name Plate Data	Maximum Voltage Overload	Effective CMRR AT 60 Hz
1294–270604	1000 v	100 mv	10 meg Ω	1000.0	v dc	1100 v	-Term.Gnd.
1294–270603	100 v	10 mv	10 meg Ω	100.00	v dc	1000 v	74 db
1294–270602	10 v	1 mv	10 meg Ω	10.000	v dc	1000 v	80 db
1294–270601	1 v	.1 mv	100meg Ω	1.0000	v dc	120 v	80 db
1294–270600	100 mv	10 μv	10 meg Ω	100.00	mv dc	60 v	80 db
1294–270609	100 ma	10 μa	1 Ω	100.00	ma dc	– – – – –	– – – – –
1294–270608	10 ma	1 μa	10 Ω	10.000	ma dc	– – – – –	– – – – –
1294–270607	1 ma	100 nA	1000Ω	1.0000	ma dc	– – – – –	– – – – –
1294–270606	100μa	10 nA	1KΩ	100.00	μa dc	– – – – –	– – – – –
1294–270605	10μa	1 nA	10KΩ	10.000	μa dc	– – – – –	– – – – –

100% overrange on all ranges except 1000 v range.

Max. overrange presentation 19,999 on all ranges except 1000 v range.

Max. voltage between common input terminal pin 10 and earth gnd pin R 500 v ac rms or dc except 1000 v range.

Specifications subject to change without notice.

TABLE 3. TABLE FOR DESIRED RANGING COMPONENTS

GENERAL

The Weston Model 1294 Digital Panel meter is a compact single range, bipolar, high impedance instrument. This instrument is designed to indicate input DC voltage or current in one of 10 possible ranges. The non-blinking digital display has a full scale count of 10000 with overrange capability of 19999.

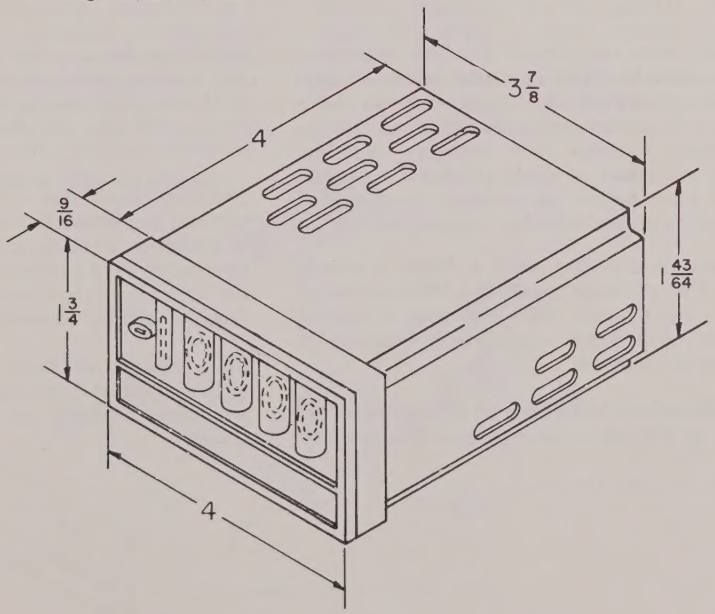


FIGURE 1. OUTLINE DIMENSIONAL DRAWING

The basic measuring circuit is a high impedance bipolar analog to digital converter which employs dual-slope integration. All design features are in keeping with panel meter applications, but the digital concept provides high accuracy, stability, linearity and speed of reading without consideration of such factors as parallax, tracking and reader interpretation inherent in analog devices.

The meter is provided with a 100% overrange capability on all ranges except the 1000 volt range. When an input above 100% overrange is applied, the display will flicker erratically to indicate the out-of-range condition.

A minus indicator is provided to indicate when the polarity of the signal being measured is negative.

Additional features are: Remote Hold, to hold the last reading displayed on the readout tubes and BCD outputs. Polarity BCD information, and external selection of decimal points thousands, hundreds, tens and units.

The case front has a circularly polarized filter window to eliminate glare. All inquiries pertaining to operation or repair of this instrument should be directed to Weston-Newark. For a pictorial view of the instrument and overall dimensions refer to Figure 1, outline dimensional drawing.

Four decades of 1–2–4–8 BCD TTL (Binary Coded Decimal Transistor, Transistor Logic) and the numeric 10000 can be provided as optional features.

INSTALLATION AND OPERATING INSTRUCTIONS

Panel Mounting

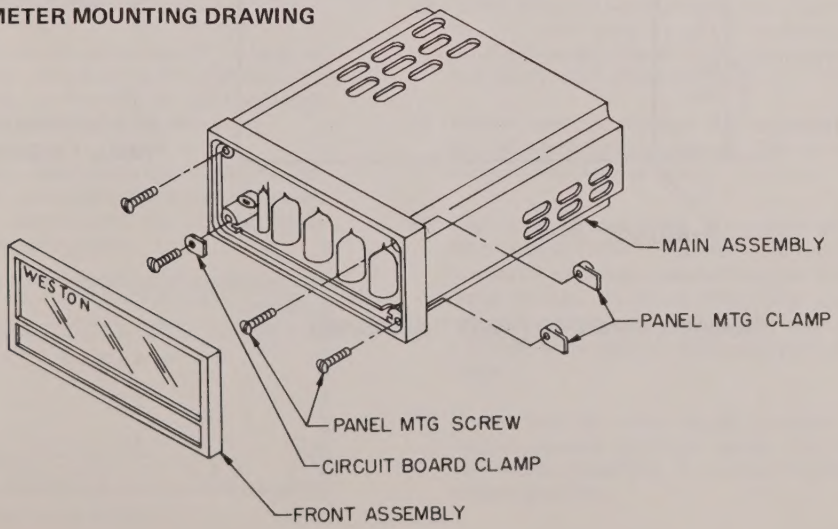
1. Unpack the meter and perform a visual inspection to assure that no damage has occurred during shipment or handling.

2. Remove front bezel. Rotate the four mounting screws (located in the four inner corners) 3 or 4 times counterclockwise to position the mounting cams correctly. Mount the main assembly (see Figure 2) on a panel 1/16 to 1/8 inch thick. The panel shall be prepared in accordance with the panel cutout dimensions as shown in Figure 3. Rotate the four mounting screws clockwise to position the mounting cams in the lock position and secure the instrument to the panel.

3. Check the display tubes to assure that they are securely mounted in their sockets. Press loose tubes down gently to obtain a secure mounting.

4. The front bezel can be secured into position at this time. The bezel will have to be removed to adjust and calibrate the meter.

FIGURE 2. METER MOUNTING DRAWING



ELECTRICAL ADJUSTMENT AND OPERATION

The Model 1294 has provisions to accept two connectors at the rear of the instrument. Upper (Analog) connector Weston Model No. 9790-0267253, Elco No. 00-6007-030-980-002 and lower (Digital) connector Weston Model No. 9790-0271102, Elco No. 00-6007-030-980-300.

For operation without optional BCD information, the upper connector (Analog) need only be used. The lower connector (Digital) is used in conjunction with the upper connector when the BCD option is desired.

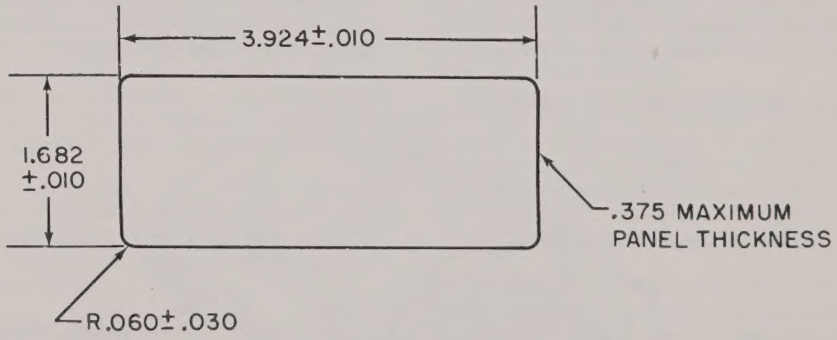


FIGURE 3. PANEL CUT–OUT DIMENSIONS

1. After the meter has been panel mounted, connect a 117 volt single phase power line and input signal to upper (Analog) connector as follows:

   a. One side of AC line to Pin#15
   b. One side of AC line to Pin #S
   c. Earth ground to Pin #R
   d. Common of input signal to Pin #10
   e. ± input signal to Pin #2 for 100 millivolts, Pin #A for all other ranges.

2. Allow instrument to warm up for a period of 30 minutes.

3. Remove front bezel assembly.

4. Connect a standard signal source ± .01% to input terminals, common to Pin #10 and "+" or "−" signal to Pin #2 for 100 millivolt range (Pin #A for all other ranges).

5. Index standard signal source to 00.00. Rotate R109 polarity zero adjustment potentiometer with a screw driver until the polarity lamp flickers or just extinguishes.

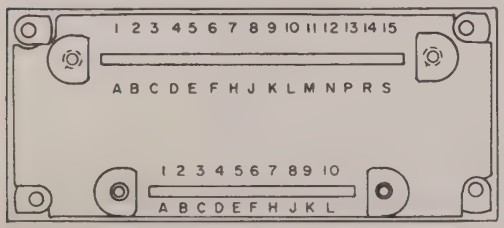


FIGURE 4. REAR CASE VIEW

6. Index standard signal source to a signal equal to "+" 10 counts (00.10 volts, 100 millivolt range) rotate R144 adjustment (pos zero) until the display indicates 00.10.

7. Index standard signal source to a signal equal to "−" 10 counts (−00.10 volts 100 millivolt range). Rotate R134 adjustment (neg. zero) until the display indicates −0010.

8. Index standard signal source to a signal equal to "+" full scale (100.00 millivolts, 100 millivolt range). Rotate R130 adjustment (pos. full scale) until display indicates 10000.

9. Index standard signal source to a signal equal to "−" full scale (−100.00 millivolts, 100 millivolt range) rotate R135 adjustment (neg. full scale) until display indicates "−" 100.00.

10. Repeat steps 4 through 9 if necessary until proper adjustment is achieved. The instrument is now ready for operation.

11. Full scale presentation of instrument is as tabulated in Table 1. However, the instrument is capable of being operated beyond full scale range by plus or minus 100%. For example, the operational range is +199.99 millivolts to −199.99 millivolts for 100 millivolt full scale range.

12. If the applied input signal is greater than ±100% beyond full scale range, the display will flicker erratically to indicate the out-of-range condition.

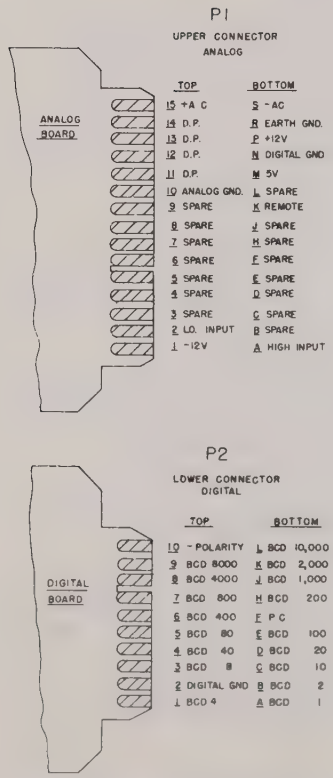


FIGURE 5. CORRECTION PIN DESIGNATIONS

13. External selection of decimal points are provided at the rear upper (analog) connector. Connecting a 22K ±10% 1/4 watt carbon resistor between Pins #N and Pins #11, 12, 13 and 14 will select decimal points units (#11), tens (#12) hundreds (#13) and thousands (#14).

    Note: Before using external decimal point selection, solder jumper must be removed from digital board. Location of jumper is at left of base of readout tubes. Position is dependent on range of instrument.

14. Table 2 depicts basic conditions which may exist during the course of normal meter operation. The example given is for a 100 millivolt range instrument.

15. To maintain the last reading on the display tubes and to maintain the last BCD output at the terminals, the Model 1294 is equipped with a remote hold. The display (and BCD) can be held by closing a switch between Pin #K remote and Pin #N, digital ground of the upper (analog) connector. The last display can be held for as long as desired. Normal operation is resumed by opening the switch.

    The polarity indication is not held.

16. **Lower Connector** (Digital)
    As an option, four decades of 1-2-4-8 BCD and the numeric 10000 can be provided at the rear lower connector (digital) of the instrument to drive external devices.

The rise and fall time of the BCD outputs are compatible with industrial TTL (Transistor -Transistor Logic) micrologic or its equal. Logic levels are: Logic 1 equal to or greater than 2.4 volts DC, and Logic 0 equal to or less than .8 volts DC. For applications where other logic levels must be met, interface criteria should be coordinated with the factory.

17. Print command Pin #F of lower connector. The purpose of P.C. is to key the external printing devices for BCD information acceptance (see Step 16). The output of Pin #F is a logic "1" for holding the printing devices and a logic "0" for a command to print.
Note: See Figures 4 and 5 for all connector pin designations.

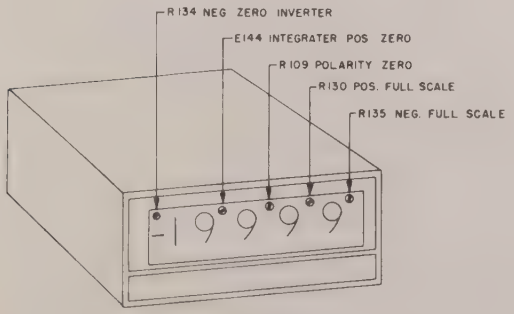


FIGURE 6.

MODEL 1294 EXTERNAL ADJUSTMENTS

18. Due to the clock frequency and the propagation delay of the counters, the capacitance of the external wiring to the BCD information becomes critical. The use of long leads or shielded wire from the BCD connector to the external interface circuitry should be avoided.

Weston therefore, will supply the digital connector with an attached RC network (Ref. Fig. 6A). This network will allow the user to connect leads up to a maximum 18 inches in length to the unit.

Note: The BCD outputs have available a load factor of two T^2L logic loads.

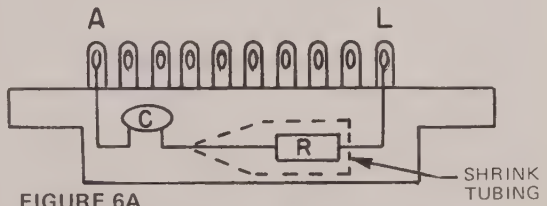


FIGURE 6A.
EXTERNAL DIGITAL (Lower) CONNECTOR

Applied Signal Voltage	Indication on Display Tubes
+ 200 to + 300 millivolts	Flicker (outrange)
+ 00 00 to + 199 99 millivolts	00 00 to 199 99
00 00 to - 199 99 millivolts	00 00 to 199 99
200 to - 300 millivolts	Flicker (outrange)

TABLE 2.
APPLIED SIGNAL VOLTAGES vs INDICATION ON DISPLAY TUBES

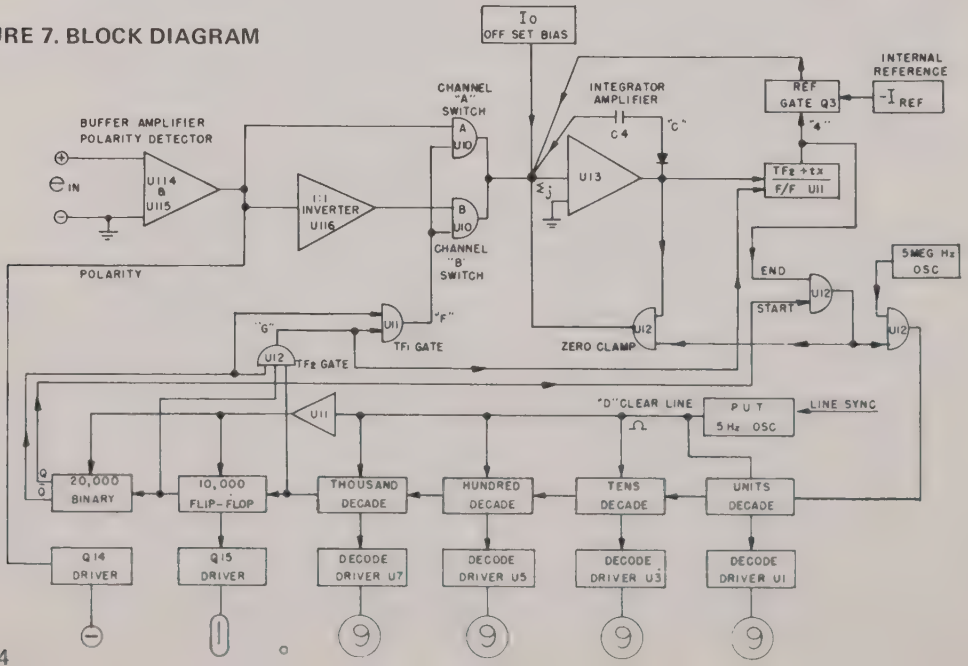
THEORY OF OPERATION

General

This section in conjunction with the block diagram Figure 7 and waveforms Figure 8 contains a discussion of the theory of operation of the Model 1294 Digital Panel Meter.

Basically, the Model 1294 is a single range, bipolar, high input impedance Digital Panel Meter. The unit is capable of being constructed as a voltmeter or ammeter with the addition of an appropriate

FIGURE 7. BLOCK DIAGRAM



attenuator or shunt. Standard self-contained voltage or current ranges are available from Weston as shown in Table 1.

The instrument utilizes a dual slope integrating technique designed with sampling intervals synchronized to the power line.

Dual slope integration converts amplitude into a ratio of two time intervals, both proportional to clock period, making the accuracy of conversion independent of; long term drifts of clock frequency, amplifier gain, integrating capacitor and zero crossing comparator. The accuracy of conversion is dependent upon the zero drift of the internal amplifiers and the internal reference circuits.

Waveforms are shown in Figure 8. The total integrating time varies from 4.0 to 8.0 milliseconds, corresponding to 20,000 counts (zero input) to 40,000 counts (100% of full scale) from a 5 mega Hertz clock.

The DC voltage to be measured is amplified to a buffer amplifier (U114 & U115) which has high input impedance and a polarity determining circuit. The buffer amplifier output voltage is ±2 volts at 40 microamperes for a ± full scale input signal.

For each readout one complete sampling interval is required to balance the effect of the unknown input signal. Each sample consists of two parts. During the first part the output of the buffer amplifier at a level of 0 to ±4 volts (0 to 80μA) is applied to the integrator. The integrator, composed of amplifier (U13) and capacitor (C4) is charged for 3.6 milliseconds then is switched off (Q8 or Q1).

During the second part the output of the integrator is restored to zero by a reference current fed back to the summing junction of the integrator through the analog gate (Q3) in a period of .4 to 4.4 milliseconds.

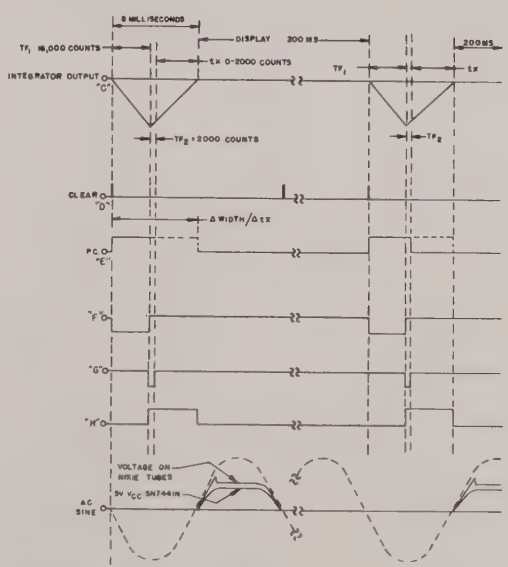


FIGURE 8. WAVEFORMS

The conversion cycle is divided into two intervals. Ramp down T_{F1} and ramp up $T_{F2} + t_x$ (to zero).

I_o = Internal offset current for 2000 counts.

I_{in} = Input current proportional to input voltage.

I_{ref} = Internal reference current.

During the first interval, the integrator charges to a value of:

$$e_o = \frac{1}{C} (I_{in} + I_o)\ T_{F1}$$

During the second interval, the integrator discharges, under the influence of I Reference.

$$e_o = \frac{1}{C} (I_{Ref} - I_{.})\ tx + \frac{1}{C} (I_{Ref} - I_o)\ T_{F2}$$

equating

$$tx = \frac{I_{in}}{(I_{Ref} - I_o)}\ T_{F1} + \frac{I_o}{(I_{Ref} - I_o)}\ (T_{F1} + T_{F2}) - \frac{I_{Ref}}{(I_{Ref} - I_o)}\ T_{F_2}$$

$$tx = \frac{I_{in}}{(I_{Ref} - I_o)} T_{F1} \quad \text{When} \quad I_{Ref} = 10 I_o \quad \text{and} \quad T_{F1} = 9 T_{F2}$$

$$tx = \frac{T_{F1}}{0.9} \cdot \frac{I_{in}}{I_{Ref}}$$

Thus making tx proportional to I_{in}. The interval

T_{F1} requires 18000 pulses.

$$nx = 20{,}000\ \frac{I_{in}}{I_{Ref}}$$

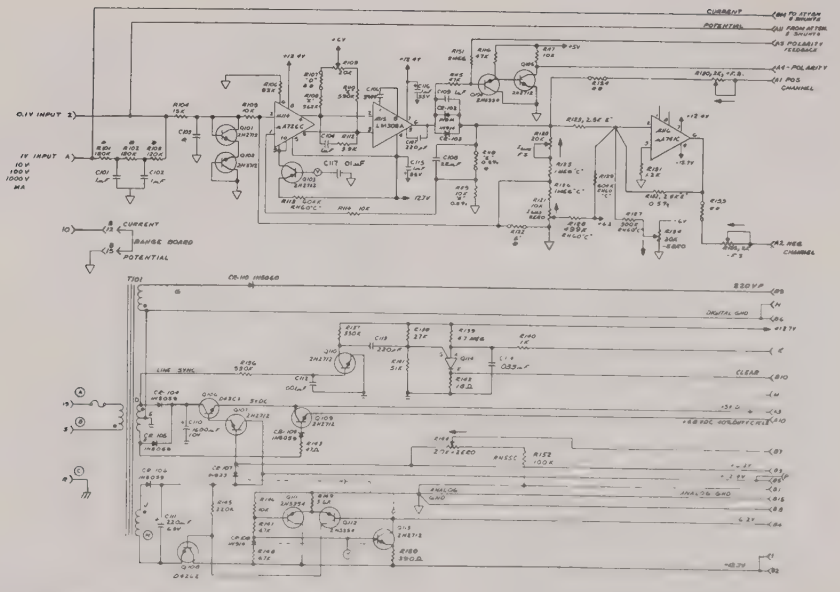
The number of pulses counted nx during the time interval tx is therefore proportional to the input signal, and independent of the clock frequency. Since the interval tx starts at 20,000 counts (0000 on display) the count at the end of tx is equal to nx. At the end of tx the counter stops and is ready for the display decode driver's to accept the coded information.

The time duration of discharge is digitized by a counter and 5 mega Hz clock, displaying 0000 to 19999 corresponding to the discharge period (tx). The entire conversion takes place during the negative half cycle 8 millisecond interval of high voltage at which time the Nixie tubes are in their "OFF" state. The Nixie tubes are turned on at the positive half cycle interval at which time the conversion is completed. When the Nixie tubes light they appear steady due to the retentivity of the eye. The conversion is cyclic and is initiated every 200 milliseconds. The display is upgraded approximately 5 times per second as determined by the R.C. time constant of the P.U.T. Oscillator synchronized to the power line.

Detailed Operation (See Block Diagram Figure 7).

As the Nixie anode voltage drops to zero, a start pulse derived from the power line triggers the P.U.T. 5 Hz oscillator. The positive pulse output of the P.U.T. resets all the decade counters also the 10,000 and 20,000 binary. With the Q output of the 20,000 binary in the low state, clock pulses from the 5 meg Hz osc are enabled into the counter chain by the t2 gate and osc gate for 20,000 counts. During the first 18,000 counts, determined by the three input T4 gate, the appropriate channel A or B switch is open to present a positive signal to the integrator amplifier (U13). The integrator zero clamp is disabled at the beginning of T1, and the integrator output voltage ramps negative to a value proportional to the amplitude of the analog input Ein. At 18,000 the analog input is switched off by the T4 gate. The reference gate is switched on for at least the period of T4 (2000 counts). If there were no analog input signal, the duration (T4) would allow the integrator output voltage to come to zero, from a value placed there by the Io offset bias. The positive pulse generated at the integrator amplifier output would turn off the control flip-flop inhibiting the reference gate and the osc gate and also enabling the zero clamp of the integrator amplifier. If there were an analog signal applied, the osc gate would remain enabled for a period t3, enabling the decade counters to count the pulses proportional to the analog signal.

Premature turn-on of the channel A or B switch after 20,000 counts, is suppressed by the Q output of the 20,000 binary counter applied to the T1 gate.



W	X	Y	40 V OL X	CURRENT RANGES

1 ALL RESISTORS 5%, 1/4 WATT COMP

2 ALL "D B C" ARE 1% METAL FILM

3 * *
SELECT AT TEST
R124 - 0.1K 1% D
R133 - 0.1K, 2K 1% D
R107 - 0.15K, 30.1K, 44.8K, 59.7K, 75K, 90.9K 1% D

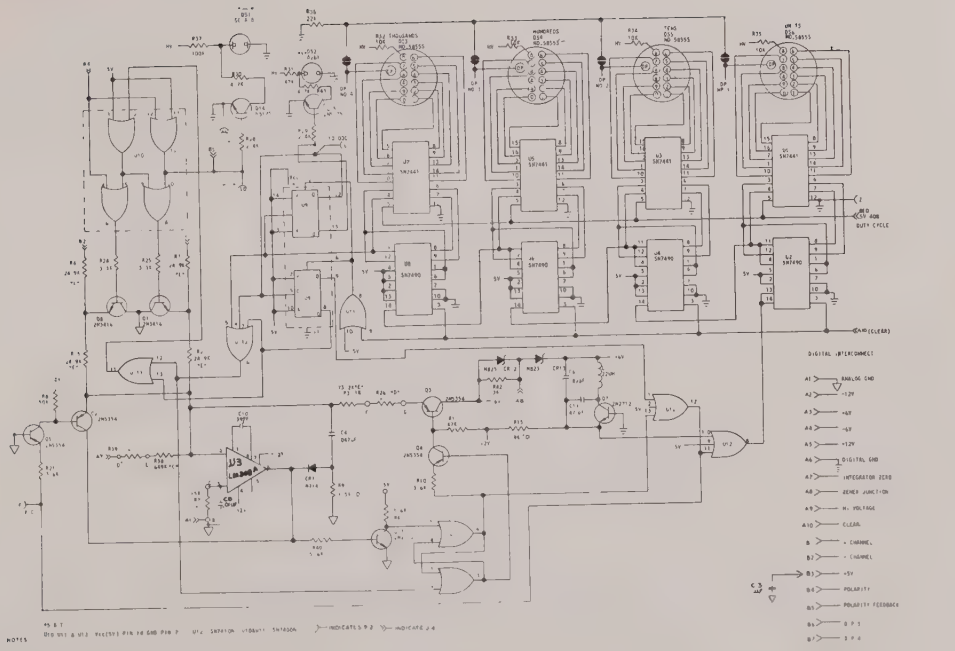
4 ⟩— INDICATES RANGE BOARD CONNECTOR J-3

⟩— INDICATES ANALOG BOARD CONNECTOR P-1

5 ⏚ INDICATES ANALOG GROUND

INDICATES DIGITAL GROUND

FIGURE 9. SCHEMATIC DIAGRAM, ANALOG



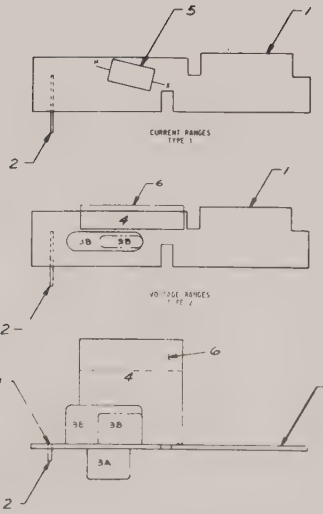
SELECT AT TEST

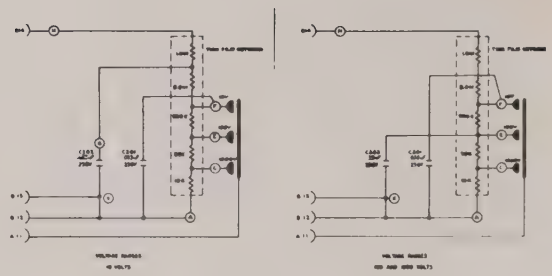
·R 39= 0, 15K, 30.1K, 44.8K, 59.7K, 75K OR 90.9K, 105K, 121K

R26= 1.5K, 3.01K, 4.48K, 5.97K, OR 7.5K, 9.09K

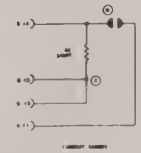
R 7 = 10K, 12K, 15K, 18K, 22K, 27K, OR 33K, 36K

FIGURE 10. SCHEMATIC DIAGRAM, DIGITAL





ITEM NO	QTY REQD	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTON
6	1	270991-901	STRIP, ADHESIVE
5		SEE TABLE	RESISTOR R20
4	1	SEE TABLE	ATTENUTOR
3	A, B, C	2 SEE TABLE	CAPACITOR .033 μF
2	1	270016-077	TERMINAL, EDGE PIN
1	1	270621-901	BOARD, DRILLED



1. REF SCHEMATIC DIAGRAM 270625
2. BRIDGE GAP WITH SOLDER ON "D" SHAPED PADS FOR APPLICABLE DECIMAL POINT ON DIGITAL BOARDS PER SELECTED RANGE
3. TRIM ALL COMPONENT LEADS TO WITHIN .05 +.00 -.03 OF BOARD SURFACE
4. PRESS TERMINAL (ITEM 2) FIRMLY AGAINST CIRCUIT BOARD & TRIM LEADS FLUSH WITH BOARD AS SHOWN

PART NUMBER	TYPE	RANGE	ITEM 3A	ITEM 3B	ITEM 4	ITEM 5
270620-901		100 MA				612136-001
270620-902		10 MA				609227-001
270620-903		1 MA				665194-00
270620-904		100 μA				
270620-905		10 μA				
270620-906	2	100MV & 1V				
270620-907	2	10 & 100V	272241-001	272241-001	269078-001	
270620-908		10V	272241-001	272241-001	269078-001	

VOLTAGE RANGES
10 VOLTS

VOLTAGE RANGES
100 AND 1000 VOLTS

CURRENT RANGES

FIGURE 11. RANGING INFORMATION

Range	C101,C102	C103	R101, R102, R103	R118	R122	Range Board
100 mV	Open	1.75 μF 269897-001	Open	190K 272258-001	55.8K 272249-001	270620--906
1 V	1. μF 269900-001	.1 μF 269900-001	120K 269989 001	10K 272257-001	Open	270620--906
10 V 100 V 1000 V	Open	269900-001 269900-001 Open	Open	10K 272257–001	Open	270620–908 270620–907 270620–907
10 μA 100 μA 1 MA 10 MA 100 MA	Open	1.75 uF 269897 001	Open	190K 272258-001	55.8K 272249-001	270620–905 270620–904 270620–903 270620–902 270620–091

TABLE 3. TABLE FOR DESIRED RANGING COMPONENTS

PARTS LIST DIGITAL BOARD
MODEL 1294

Reference	Description	Weston Part No.
	Board Assembly, Digital	270617-901
C4	Capacitor .047 μF	60991-001
C6	Capacitor 82 pF	272262-001
C10	Capacitor 39 pF	269949-001
C11	Capacitor 47 pF	272261-001
CR-1	Diode IN914	61025-001
CR-12	Diode IN825	266309-001
CR-13	Diode IN823	60978-001
L1	Inductor 22 μH	272270-001
Q1, Q8	Transistor 2N3416	263642-001
Q2, Q3, Q4, Q5	Transistor 2N5354	268795-001
Q7, Q13	Transistor 2N2712	39917-001
Q14, Q15	Transistor 2N5175	266585-001
R1, R2, R4, R5	Resistor 24.9K ohms	272251-001
R3	Resistor 73.2K ohms	272252-001
R9	Resistor 1.5K ohms	270156-001
R7	Factory Selected	270627-001
R8	Resistor 150K ohms	263653-001
R10, R21	Resistor, 3.6K ohms	266373-001
R11, R31, R37	Resistor 47K ohms	264676-001
R15	Resistor 9.1K ohms	270121-001

Reference	Description	Weston Part No.
R24, R25	Resistor 3.3K ohms	269890-001
R26	Factory Selected	270628-001
R28, R29, R40	Resistor 2.4K ohms	266615-001
R30	Resistor 4.7K ohms	263652-001
R32, R33, R34, R35	Resistor 10K ohms	264673-001
R36	Resistor 22K ohms	264674-001
R38	Resistor 649K ohms	272279-001
R39	Factory Selected	270629-001
U1, U3, U5, U7	Microcircuit SN7441AN	272266-001
U2, U4, U6, U8	Microcircuit SN7490N	272267-001
U9	Microcircuit SN7473N	272265-001
U10, U11	Microcircuit SN7400N	272264-001
U12	Microcircuit SN7410N	272268-001
U13	Microcircuit LM308A	272408-001
V1, V2, V3, V4	Nixie Tube Burroughs #58553	266601-001
XV1, XV2, XV3, XV4	Nixie Socket	266602-001
	Connector, Card Edge	270182-001
	Lamp GE A1B	269877-001
	Lamp A261	266537-001
	Tubing Teflon #20 AWG 1" lg	265552-904
	Tubing Teflon #20 AWG 9/16" lg	265552-915
	Transformer Bracket	265669-001

Reference	Description	Weston Part No.
	Board Assembly, Analog	270613-901
C101, C102, C103	Capacitor selected from range/table	
C104, C109	Capacitor .1 μF	269900-001
C106	Capacitor .39pF	269949-001
C107, C113	Capacitor 220 pF	264091-001
C108	Capacitor .22 μF	272263-001
C110	Capacitor 1600 μF	266607-001
C111	Capacitor 220 μF	272269-001
C112	Capacitor .001 μF	263666-001
C114	Capacitor .033 μF	272241-001
C115, C116	Capacitor 1 μF	270163-001
CR-102, CR-103, CR-108	Diode IN914	61025-001
CR104, CR105, CR106 CR109	Diode IN5059	266611-001
CR107	Diode IN823	60978-001
CR110	Diode IN5060	266591-001
F101	Fuse .25 amp	268798-001
Q101, Q102, Q103, Q105 Q107, Q109, Q110, Q113	Transistor 2N2712	39917-001
Q104, Q111, Q112	Transistor 2N5354	268795-001
Q106, Q108	Transistor D42C2	269902-001
Q114	Transistor D13T1	272205-001
R101, R102, R103	Resistor selected from range/table	
R104	Resistor 15K ohms	263655-001
R105, R114, R117, R146	Resistor 10K ohms	264673-001

Reference	Description	Weston Part No.
R106	Resistor 82K ohms	272248-001
R107	Factory selected	270629-001
R108	Resistor 562K ohms	272253-001
R109, R144	Potentiometer 20K ohms	264004-001
R110	Resistor 590K ohms	272255-001
R111	Resistor 1.5K ohms	264677-001
R112	Resistor 3.9K ohms	264671-001
R113, R124	Resistor 604K ohms	272254-001
R115, R116	Resistor 47K ohms	264676-001
R118	Resistor selected from range/table	
	Resistor 10K ohm	272257-001
R120	Potentiometer 20K ohms	272260-001
R121	Potentiometer 10K ohm	266515-001
R122	Resistor selected from range/table	
R123, R132	Resistor 2.49K ohms	272250-001
R124	Factory selected	270630-001
R125, R126	Resistor 1M ohms	266312-001
R127	Resistor 300K ohms	272256-001
R128	Resistor 150K ohms	264787-001
R130, R135	Potentiometer 2K ohms	266306-001
R131	Resistor 1.2K ohms	266614-001
R133	Factory selected	270630-001
R134	Potentiometer 20K ohms	272259-001

Reference	Description	Weston Part No.
R136, R137	Resistor 330K ohms	270088-001
R138	Resistor 27K ohms	272209-001
R139, R147, R148	Resistor 4.7K ohms	263652-001
R140	Resistor 1K ohm	266612-001
R141	Resistor 51K ohms	272247-001
R142	Resistor 18 ohms	272245-001
R143	Resistor 47 ohms	61218-001
R145	Resistor 220K ohms	264672-001
R149	Resistor 5.6K ohms	265819-001
R150	Resistor 390 ohms	272246-001
R151	Resistor 2M ohms	269932-001
T101	Power Transtormer	
	117/234V primary	270631-901
	117V primary	271081-901
U114	Microcircuit μA 726C	266370-001
U115	Microcircuit LM308A	272408-001
U116	Microcircuit μA741C	272271-001
	Background Mask	271098-901
	Basic Range Board	270620
	Connector, Card Edge	270181-001

WESTON EQUIPMENT WARRANTY

Weston warrants equipment of its manufacture against defective materials or workmanship for a period of one year from date of shipment.

The liability of Seller under this warranty is limited, at Seller's option, solely to repair, replacement with equivalent Weston equipment, at an appropriate credit adjustment not to exceed the original equipment sales price, of equipment returned to the Seller provided that (a) Seller is promptly notified in writing by Buyer upon discovery of defects, (b) Upon receipt of written authorization from Seller the defective equipment is returned as directed, transportation charges prepaid by Buyer, and, (c) Seller's examination of such equipment discloses to its satisfaction that defects were not caused by negligence, misuse, improper installation, accident, or unauthorized repair or alteration by the Buyer.

This warranty does not include mechanical parts failing from normal usage nor does it cover limited life electrical components which deteriorate with age such as tubes, lamps, etc.

This warranty is in lieu of all other warranties, expressed or implied, including the implied warranty of fitness for a particular purpose to the original purchaser or to any other person. Seller shall not be liable for consequential damages of any kind.

The aforementioned provisions do not extend the original warranty period of any article which has been either repaired or replaced by Seller.

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